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ABSTRACT

The purpose of this study was to determine whether a process model could be constructed using steps identified from flow charts which accounted for somewhat more variance in predicting the difficulty of two-digit multiplication problems than did a process model developed by Cromer. Cromer's data and variables were used as a starting point. Ten new variables were identified from multiplication and addition flow charts. Seven basic models, 4 reduced models, 10 factor models, 24 one-variable models, and a set of systematic restricted models were examined. Multiple regression analysis was used to predict difficulty. The overall results indicate that the flow chart variables do produce somewhat better models. This volume is the second of two parts dealing with this study, and includes a discussion of results and the appendices. (Author/SD)

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TECHNICAL REPORT NO. 337
(PART 2 OF 2 PARTS)

process models for predicting the difficulty of multiplication problems using flow charts

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JULY 1975

WISCONSIN RESEARCH
AND DEVELOPMENT
CENTER FOR
COGNITIVE LEARNING

SE019 855

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Technical Report No. 337 (Part 2 of 2 Parts)

PROCESS MODELS FOR PREDICTING THE DIFFICULTY OF MULTIPLICATION PROBLEMS USING FLOW CHARTS

by

Thomas A. Romberg
Richard Glove

Report from the Project on
Conditions of School Learning and
Instructional Strategies

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CENTER FOR COGNITIVE LEARNING

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ABSTRACT

The purpose of this study was to determine whether a process model could be constructed using steps identified from flow charts which accounted for somewhat more variance in predicting the difficulty of two-digit multiplication problems than did a process model developed by Cromer (1971). Cromer's data and variables were used as a starting point. Ten new variables were identified from multiplication and addition flow charts. Seven basic models, 4 reduced models, 10 factor models, 24 one-variable models, and a set of systematic restricted models were examined. Multiple regression analysis was used to predict difficulty. The overall results indicate that the flow chart variables do produce somewhat better models.

III

DISCUSSION OF RESULTS

The basic purpose of this study was to determine whether adaptation of Cromer's models could account for more of the variance. The adaptation consisted of replacing Cromer's variables OA and OM with 10 variables obtained by counting the number of the various types of steps involved in following a flow chart routine for the multiplication of two-digit by two-digit numbers. This model (Model 4) accounted for somewhat more of the variance than did the basic Cromer model (Model 1). Model 4 had an R^2 value of .7855 and Model 1 had an R^2 value of .7763, and the corrected R^2 values were .7564 and .7558 for Models 4 and 1, respectively.

When considering the individual contributions made by each of the variables in Model 4, it was apparent that very few of the variables made a significant individual contribution. It was therefore decided to try several other models in which the 10 new variables would be kept intact and some of the other process variables would be deleted. Model 7 used only the 10 new variables and the 4 digit variables and had an R^2 value of .7613 with a corrected R^2 value of .7428. These values are only slightly less than the values from Model 4.

Next, a model was constructed which used the 4 digit variables, the 10 new variables, and the process variables LDF, SDF, NDP, SMD, and LFS. This model (Model 9) had an R^2 value of .7831, which is only slightly below the values in Models 1 and 4. However, the corrected R^2 value (.7585) was larger than for all other models.

The last model (Model 11) deleted SMD from the previous model and yielded an R^2 of .7665 and a corrected R^2 of .7417. These are the second lowest values for any of the process and digit models.

Overall, Model 9 yielded the highest corrected R^2 value, and Model 4 the highest R^2 value. Table 57 summarizes the basic characteristics of all the models considered.

The following conclusions may be drawn:

1. The new flow chart variables do produce models that account for somewhat more of the variance in difficulty than do Cromer's models.
2. All of the process models accounted for less of the variance in difficulty than did the corresponding process and digit models.
3. In all cases, the models produced from the factor analysis accounted for less of the variance than did the corresponding complete model. The smallest difference between a full model and a factor model was an R^2 of .0144 and a corrected R^2 of .0058 for Models 10 and 10F. Comparisons between the different factor models should be made carefully,

since each group of factors accounted for somewhat different percentages of the total factor variance and of the total variance.

4. Other than in the models generated from the factors, most of the variables did not account for a significant percentage of the independent variance. This can be expected to a certain extent, since NDM + NOM + NWM = TSM and NDA = NOA + NWA = TSA.
5. The factor analysis of the models containing the 10 new variables fairly consistently yielded factors which seemed to correlate highly with a set of multiplication variables, a set of addition variables, a set of variables relating to the number of digits carried in multiplication, and a set relating to the number of digits carried in addition.

When the other process and digit variables were considered along with the 10 new variables, the factors extracted correlated highly with the four types of factors listed above, or with the order of the numbers, the size of the numbers, or the number of digits in the product. This would suggest that perhaps a better set of variables could be found to represent these factors. The present variables do, however, appear to be fairly representative of the factors.

Several ideas for future research are suggested by the results of this study:

1. The flow charts could be shortened or improved to give a better reflection of the method that an individual would use in solving a multiplication problem.
2. The variables YDM and YDA need to be examined to determine if the questions are being asked in the proper way, or whether they should be phrased negatively.
3. There is a need for investigation into whether this procedure of using a flow chart works equally well for other arithmetic operations and whether counting the number of steps involved in completing a routine is useful.

Counting the steps of various types followed in a flow chart routine appears to be a fairly good scheme for building a process model for multiplication problems. Including variables dealing with the size of the numbers and the number of digits in the product with the flow chart variables produced the best models. Whether this procedure would work equally well for other arithmetic operations will have to be established. It is hoped that this information will prove useful in developing a general theory of mathematics learning.

TABLE 57

SUMMARY OF ALL MAJOR
MODELS CONSIDERED

Model	R^2	Corrected R^2
Cromer's Models		
Complete		
1	.7763	.7558
1F	.7053	.6924
1FC	.6572	.6487
Digit		
2	.6879	.6802
Process		
3	.7454	.7309
3F	.6626	.6545
3FC	.6049	.5977
New Models		
4	.7855	.7564
5	.7405	.7149
5F	.6926	.6771
6	.6400	.6219
6F	.5877	.5775
7	.7613	.7428
7F	.6495	.6342
8	.7404	.7184
8F	.7016	.6866
9	.7831	.7585
9F	.7339	.7187
10	.7245	.7032
10F	.7101	.6974
11	.7665	.7417
11F	.7143	.6980

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Adademic Computing Center. REGAN 2: Multiple linear regression analysis, Madison: The University of Wisconsin-Madison, 1971.

Cromer, F. E. Structural models for predicting the difficulty of multiplication problems. Nashville, Tennessee: George Peabody College for Teachers, 1971.

Romberg, T. A., & Anglin, L. Flowcharts of algorithms. Project Paper 72-5. Madison, Wisconsin: Wisconsin Research and Development Center for Cognitive Learning, 1973.

77/78

TABLE 58

RAW DATA

Form 1

Problem Characteristics																							Gen. DIFF
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	
1	4	1	0	1	5	1	2	2	9	0	0	0	0	0	0	2	0	0	4	0	2	0	0	.03
2	3	6	7	3	7	2	8	4	19	4	0	3	4	11	1	6	0	2	7	3	4	0	1	.25
3	7	3	5	8	7	2	8	4	19	4	2	7	4	15	4	6	2	2	8	3	4	0	0	.32
4	4	0	3	4	7	0	4	4	15	4	0	3	4	11	1	2	0	0	4	0	4	0	0	.11
5	4	3	1	6	6	2	4	3	13	4	1	3	3	10	2	3	0	1	6	1	3	0	0	.19
6	4	0	6	2	7	0	4	4	15	3	1	2	4	9	0	2	0	0	6	0	4	0	1	.08
7	4	4	7	8	7	2	8	4	19	4	1	5	4	13	2	6	1	2	8	4	4	1	1	.15
8	2	4	4	9	7	2	8	4	19	4	2	3	3	10	3	6	1	2	9	2	4	0	1	.22
9	7	6	5	2	7	2	8	4	19	4	0	3	4	11	1	6	0	2	7	2	4	0	0	.16
10	8	5	9	3	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	3	4	0	1	.27
11	4	7	4	9	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	4	4	0	1	.29
12	3	0	9	5	7	0	4	4	15	4	0	3	4	11	1	2	0	0	9	0	4	0	1	.18
13	4	9	3	9	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	3	4	0	0	.35
14	6	1	5	5	6	1	2	3	11	4	0	3	4	11	0	2	0	0	6	1	4	1	0	.10
15	8	2	4	1	5	1	2	3	10	4	2	4	4	12	2	2	1	0	8	1	4	0	0	.14

TABLE 58 (continued)

Form 1

										Problem Characteristics														Gen.
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
16	8	7	7	3	7	2	8	4	19	4	1	5	4	13	2	6	1	2	8	3	4	0	0	.34
17	5	4	5	7	7	2	8	4	19	4	1	5	4	13	2	6	1	2	7	4	4	0	1	.24
18	8	9	5	9	7	2	8	4	19	4	1	5	4	13	2	6	1	2	9	5	4	0	0	.33
19	5	7	7	5	7	2	8	4	19	4	2	7	4	15	4	6	2	2	7	5	4	0	1	.22
20	6	5	0	2	5	2	4	2	11	0	0	0	0	0	0	3	0	1	6	0	3	0	0	.04
21	9	0	1	6	6	1	2	3	11	4	2	3	3	10	2	1	1	0	9	0	4	0	0	.24
22	3	7	0	3	5	2	4	2	11	0	0	0	0	0	0	3	0	1	7	0	3	0	0	.08
23	7	4	5	0	5	3	4	3	12	0	0	0	0	0	0	3	0	1	7	0	4	0	0	.15
24	9	5	5	2	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	2	4	0	0	.16
25	7	7	0	7	5	2	4	2	11	0	0	0	0	0	0	3	0	1	7	0	3	1	0	.09
26	2	8	7	9	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	2	4	0	1	.38
27	2	2	6	6	6	2	4	3	13	4	0	3	4	11	2	6	0	2	6	2	4	1	1	.14
28	5	6	5	4	7	2	8	4	19	4	1	5	4	13	2	6	1	2	6	4	4	0	0	.15
29	9	6	3	8	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	3	4	0	0	.29
30	5	9	9	6	7	2	8	4	19	4	0	3	4	11	2	6	0	2	9	5	4	0	1	.38
31	1	1	1	4	6	1	2	3	11	3	2	2	3	8	1	0	0	0	4	1	3	1	1	.08
32	4	8	9	7	7	2	8	4	19	4	0	3	4	11	2	6	0	2	9	4	4	0	1	.44

TABLE 58 (continued)

Form 1

ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	Gen. DIFF
										Problem Characteristics													
33	5	6	0	1	1	1	0	1	2	0	0	0	0	0	0	0	0	0	6	0	2	0	0	.02
34	2	1	4	5	7	0	4	4	15	4	1	3	3	10	1	2	0	0	5	1	3	0	1	.08
35	3	1	0	2	5	1	2	2	9	0	0	0	0	0	0	1	0	0	3	0	2	0	0	.04
36	8	1	6	1	5	1	2	3	10	4	2	4	4	12	2	1	1	0	8	1	4	0	0	.18
37	5	7	1	6	6	2	4	3	13	4	2	5	3	12	3	3	1	1	7	1	3	0	0	.15
38	2	5	3	4	7	2	8	4	19	4	1	3	3	10	1	6	0	2	5	2	3	0	1	.12
39	5	5	7	6	7	2	8	4	19	4	1	5	4	13	3	6	1	2	7	5	4	1	1	.14
40	8	9	5	1	5	2	4	3	12	4	2	4	4	12	2	3	1	1	9	1	4	0	0	.18
41	7	0	6	5	7	0	4	4	15	4	0	3	4	11	1	2	0	0	7	0	4	0	0	.13
42	6	1	1	2	6	1	2	3	10	4	1	3	3	10	2	1	0	0	6	1	3	0	0	.08
43	5	3	3	8	7	1	6	4	17	4	2	7	4	15	4	5	2	1	8	3	4	0	0	.17
44	5	7	3	7	7	2	8	4	19	4	2	7	4	15	4	6	2	2	7	3	4	0	0	.24
45	4	0	9	6	7	0	4	4	15	4	0	3	4	11	1	2	0	0	9	0	4	0	1	.13
46	1	8	0	0	1	1	0	1	2	0	0	0	0	0	0	0	0	0	8	0	1	1	0	.03
47	6	7	5	6	7	2	8	4	19	4	0	3	4	11	1	6	0	2	7	5	4	0	0	.18
48	6	4	3	1	5	2	4	3	12	3	1	2	4	9	1	3	0	1	6	1	4	0	0	.11
49	1	5	2	0	5	3	4	3	12	0	0	0	0	0	0	2	0	1	5	0	3	0	1	.10

TABLE 58 (continued)

Form 1

Problem Characteristics																							Gen.
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
50	2	3	7	5	7	2	8	4	19	4	0	3	4	11	2	6	0	2	7	2	4	0	1	.18
51	3	2	0	4	5	1	2	2	9	0	0	0	0	0	0	2	0	0	4	0	3	0	0	.04
52	2	6	8	9	7	2	8	4	19	4	1	5	4	13	2	6	1	2	9	2	4	0	1	.28
53	9	1	0	6	5	1	2	2	9	0	0	0	0	0	0	1	0	0	9	0	3	0	0	.14
54	1	3	5	1	4	2	5	3	12	3	2	2	3	8	1	2	0	1	5	1	3	0	1	.09
55	8	0	1	1	3	2	0	2	5	3	2	2	3	8	0	0	0	0	8	0	3	1	0	.05
56	8	6	7	1	5	2	4	3	12	4	2	3	3	12	2	3	1	1	8	1	4	0	0	.36
57	1	9	3	8	7	2	8	4	19	4	2	5	3	12	3	4	1	2	9	1	3	0	1	.30
58	4	5	6	8	7	2	8	4	19	4	1	5	4	13	2	6	1	2	8	4	4	0	1	.28
59	7	9	6	8	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	6	4	0	0	.48
60	8	8	1	4	6	2	4	3	13	4	3	5	3	12	4	3	2	1	8	1	4	1	0	.21
61	6	9	0	1	1	1	0	1	2	0	0	0	0	0	0	0	0	0	9	0	2	0	0	.00
62	1	7	2	7	7	2	8	4	19	4	1	3	3	10	2	4	0	2	7	1	3	0	1	.18
63	9	9	5	7	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	5	4	1	0	.26
64	2	2	8	8	6	2	4	3	13	4	1	5	4	13	3	6	1	2	8	2	4	1	1	.15
65	6	0	0	5	5	1	2	2	9	0	0	0	0	0	0	1	0	0	6	0	3	0	0	.06
66	1	1	1	6	6	1	2	3	11	3	2	2	3	8	1	0	0	0	6	1	3	1	1	.10

TABLE 58 (continued)

Form 1		Problem Characteristics																						Gen.
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
67	8	6	7	1	6	1	2	3	11	4	0	3	4	11	2	2	0	0	7	1	4	1	1	.17
68	9	6	9	3	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	3	4	0	0	.28
69	9	2	5	1	5	2	4	3	12	3	1	2	4	9	0	3	0	1	9	1	4	0	0	.08
70	5	6	3	7	7	2	8	4	19	4	1	7	4	15	4	6	2	2	7	3	4	0	0	.22
71	6	4	3	8	7	2	8	4	19	4	1	5	4	13	3	6	1	2	8	3	4	0	0	.31
72	6	6	3	8	7	2	8	4	19	4	2	7	4	15	4	6	2	2	8	3	4	1	0	.25
73	3	3	0	9	5	2	4	2	11	0	0	0	0	0	0	3	0	1	9	0	3	1	0	.14
74	5	9	2	7	7	2	8	4	19	4	0	3	4	11	2	6	0	2	9	2	4	0	0	.27
75	7	1	5	6	7	0	4	4	15	4	0	3	4	11	2	2	0	0	7	1	4	0	0	.20
76	5	0	0	3	5	1	2	2	9	0	0	0	0	0	0	1	0	0	5	0	3	0	0	.02
77	7	4	7	4	7	2	8	4	19	4	1	5	4	13	3	6	1	2	7	4	4	0	0	.33
78	3	7	4	6	7	2	8	4	19	4	1	5	4	13	3	6	1	2	7	3	4	0	1	.25
79	1	7	0	5	5	2	4	2	11	0	0	0	0	0	0	1	0	1	7	0	2	0	0	.05
80	9	0	5	9	7	0	4	4	15	4	1	5	4	13	2	2	1	0	9	0	4	0	0	.17
81	6	6	0	6	5	2	4	2	11	0	0	0	0	0	0	3	0	1	6	0	3	1	0	.08
82	0	4	0	6	3	1	1	1	5	0	0	0	0	0	0	2	0	1	6	0	2	0	1	.02
83	4	8	6	5	7	2	8	4	19	4	2	7	4	15	4	6	2	2	8	4	4	0	1	.30
84	2	7	0	8	5	2	4	2	11	0	0	0	0	0	0	3	0	1	8	0	3	0	0	.21

TABLE 58 (continued)

Form 2

ORD	Problem Characteristics																							Gen.
	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
1	2	2	3	7	7	1	6	4	17	4	2	5	3	12	3	5	1	1	7	2	3	1	1	.26
2	2	0	4	0	5	1	1	2	10	0	0	0	0	0	0	1	0	0	4	0	3	0	1	.09
3	3	7	1	3	6	2	4	3	13	4	1	3	3	10	2	3	0	0	7	1	3	0	0	.16
4	2	9	3	1	5	2	4	3	12	3	2	2	3	8	1	3	0	1	9	1	3	0	1	.21
5	7	2	0	1	1	1	0	1	2	0	0	0	0	0	0	0	0	0	7	0	2	0	0	.02
6	9	3	9	9	6	2	4	3	13	4	2	7	4	15	4	6	2	2	9	3	4	1	1	.23
7	5	8	0	1	1	1	0	1	2	0	0	0	0	0	0	0	0	0	8	0	0	0	0	.02
8	5	2	0	5	5	2	4	2	11	0	0	0	0	0	0	3	0	1	5	0	3	0	0	.06
9	7	3	0	5	5	1	4	2	11	0	0	0	0	0	0	3	0	1	7	0	3	0	0	.09
10	2	9	2	1	5	2	4	3	12	4	3	4	3	11	2	3	1	1	9	1	3	0	0	.18
11	2	7	1	0	4	3	0	2	6	0	0	0	0	0	0	0	0	0	7	0	3	0	0	.08
12	4	2	1	9	6	2	4	3	13	4	1	3	3	10	2	3	0	1	9	1	3	0	0	.20
13	2	2	8	2	7	1	6	4	17	4	2	4	4	12	2	5	1	1	8	2	4	1	1	.12
14	4	3	6	6	6	2	4	3	13	4	1	5	4	13	3	6	1	2	6	3	4	1	1	.21
15	7	9	3	7	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	3	4	0	0	.28
16	2	8	7	1	5	2	4	3	12	3	1	2	4	9	1	3	0	1	8	1	4	0	1	.24
17	6	6	8	5	7	2	8	4	19	4	1	5	4	13	3	6	1	2	8	5	4	1	1	.34
18	8	9	4	4	6	2	4	3	13	4	1	5	4	13	3	6	1	2	9	4	4	1	0	.29

TABLE 58 (continued)

Form 2

		Problem Characteristics																						Gen.
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
19	8	4	5	5	6	2	4	3	13	4	0	3	4	11	1	6	0	2	8	4	4	1	0	.22
20	3	6	8	5	7	2	8	4	19	4	2	7	4	15	4	6	2	2	8	3	4	0	1	.36
21	4	2	2	9	7	1	6	4	17	4	3	5	3	12	4	5	2	1	9	2	4	0	0	.24
22	7	8	7	3	7	2	8	4	19	4	0	3	4	11	2	6	0	2	8	3	4	0	0	.36
23	3	0	0	5	5	1	2	2	9	0	0	0	0	0	0	1	0	0	5	0	3	0	0	.02
24	9	5	2	9	7	2	8	4	19	4	1	5	4	13	2	6	1	2	9	2	4	0	0	.22
25	5	8	9	4	7	2	8	4	19	4	0	3	4	11	2	6	0	2	9	4	4	0	1	.35
26	9	7	2	3	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	2	4	0	0	.27
27	1	7	0	5	5	2	4	2	11	0	0	0	0	0	0	2	0	1	7	0	2	0	0	.05
28	8	5	9	5	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	5	4	0	1	.31
29	5	8	2	5	7	2	8	4	19	4	1	5	4	13	3	6	1	2	8	2	4	0	0	.34
30	3	6	3	7	7	2	8	4	19	4	1	5	4	13	2	6	1	2	7	3	4	0	1	.31
31	1	6	1	2	6	2	4	3	13	3	2	2	3	8	1	2	0	1	6	1	3	0	0	.14
32	9	6	6	7	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	6	4	0	0	.38
33	5	0	6	8	7	0	4	4	15	4	0	3	4	11	0	2	0	0	8	0	4	0	1	.18
34	9	6	0	0	1	1	0	1	2	0	0	0	0	0	0	0	0	0	9	0	1	1	0	.07
35	8	9	6	1	5	2	4	3	12	4	2	4	4	12	2	3	1	1	9	1	4	0	0	.29
36	2	6	4	6	7	2	8	4	19	4	0	3	4	11	1	6	0	2	6	2	4	0	1	.28

TABLE 58 (continued)

Form 2	Problem Characteristics																							Gen.
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
37	9	3	3	2	7	0	4	4	15	4	1	5	4	13	3	4	1	0	9	2	4	0	0	.15
38	8	7	0	4	5	2	4	2	11	0	0	0	0	0	0	3	0	1	8	0	3	0	0	.14
39	8	3	5	0	5	3	4	3	12	0	0	0	0	0	0	3	0	1	8	0	4	0	0	.14
40	8	8	7	6	7	2	8	4	19	4	0	3	4	11	2	6	0	2	8	6	4	1	0	.34
41	6	8	4	7	7	2	8	4	19	4	1	5	4	13	3	6	1	2	8	4	4	0	0	.38
42	1	9	4	0	5	3	4	3	12	0	0	0	0	0	0	2	0	1	9	0	3	0	1	.22
43	2	8	8	1	5	2	4	3	12	3	1	2	4	9	1	3	0	1	8	1	4	0	1	.30
44	8	0	3	7	7	0	4	4	15	4	0	3	4	11	1	2	0	0	8	0	4	0	0	.24
45	7	3	8	3	7	1	6	4	17	4	1	5	4	13	3	5	1	1	8	3	4	0	1	.27
46	8	2	3	7	7	1	6	4	17	4	2	7	4	15	4	5	2	1	8	2	4	0	0	.31
47	2	5	3	9	7	2	8	4	19	4	1	3	3	10	2	6	0	2	9	2	3	0	1	.19
48	2	0	7	1	5	1	2	3	10	3	1	2	4	9	0	1	0	0	7	0	4	0	1	.12
49	9	7	4	5	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	4	4	0	0	.39
50	2	2	5	7	7	2	8	4	19	4	0	3	4	11	1	6	0	2	7	2	4	1	1	.15
51	1	8	9	0	5	3	4	3	12	0	0	0	0	0	0	2	0	1	9	0	4	0	1	.22
52	4	3	0	4	5	2	4	2	11	0	0	0	0	0	0	3	0	1	4	0	3	0	0	.12
53	7	1	9	1	5	1	2	3	10	4	2	4	4	12	2	1	1	0	9	1	4	0	1	.24
54	1	7	4	8	7	2	8	4	19	4	2	5	3	12	3	4	1	2	8	1	3	0	1	.30
55	3	8	5	0	5	3	4	3	12	0	0	0	0	0	0	3	0	1	8	0	4	0	1	.14

TABLE 58 (continued)

Form 2

						Problem Characteristics																		Gen.
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
56	2	1	9	5	7	0	4	4	15	4	0	3	4	11	1	2	0	0	9	1	4	0	1	.13
57	7	1	7	7	6	1	2	3	11	4	2	7	4	15	4	2	2	0	7	1	4	1	1	.13
58	6	5	5	4	7	2	8	4	19	4	1	5	4	13	3	6	1	2	6	4	4	0	0	.21
59	9	9	5	2	7	2	8	4	19	4	2	7	4	15	4	6	2	2	9	2	4	1	0	.26
60	4	9	3	7	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	3	4	0	0	.35
61	5	4	0	2	5	1	2	2	9	0	0	0	0	0	0	2	0	0	5	0	3	0	0	.02
62	9	1	8	5	7	0	4	4	15	4	1	5	4	13	3	2	1	0	9	1	4	0	0	.26
63	6	5	4	3	7	2	8	4	19	4	0	3	4	11	1	6	0	2	6	3	4	0	0	.21
64	8	4	9	0	5	3	4	3	12	0	0	0	0	0	0	3	0	1	9	0	4	0	1	.23
65	2	4	5	9	7	2	8	4	19	4	0	3	4	11	1	6	0	2	9	2	4	0	1	.21
66	9	0	0	4	5	1	2	2	9	0	0	0	0	0	0	1	0	0	9	0	3	0	0	.10
67	7	8	3	2	7	2	8	4	19	4	0	3	4	11	2	6	0	2	8	2	4	0	0	.21
68	4	6	2	0	5	3	4	3	12	0	0	0	0	0	0	3	0	1	6	0	3	0	0	.15
69	2	2	4	9	7	1	6	4	17	4	3	5	3	12	4	5	2	1	9	2	4	1	1	.16
70	1	4	5	3	7	2	8	4	19	3	2	2	3	8	0	4	0	2	5	1	3	0	1	.24
71	4	9	8	1	5	2	4	3	12	3	1	2	4	9	1	3	0	1	9	1	4	0	1	.34
72	1	4	1	0	4	3	0	2	6	0	0	0	0	0	0	0	0	0	4	0	3	0	0	.08

TABLE 58 (continued)

Form 2																								Gen.
										Problem Characteristics														
ORD	TDF	UDF	TDS	UDS	NDM	YDM	NOM	NWM	TSM	NDA	YDA	NOA	NWA	TSA	OA	OM	DCA	DCM	LDF	SDF	NDP	SMD	LFS	DIFF
73	9	6	2	6	7	2	8	4	19	4	1	5	4	13	3	6	1	2	9	2	4	0	0	.31
74	9	0	2	5	7	0	4	4	15	4	1	5	4	13	2	2	1	0	9	0	4	0	0	.24
75	8	3	8	4	7	2	8	4	19	4	0	3	4	11	2	6	0	2	8	3	4	0	1	.31
76	6	1	9	8	7	0	4	4	15	4	1	5	4	13	3	2	1	0	9	1	4	0	1	.27
77	1	8	2	9	7	2	8	4	19	4	2	5	3	12	3	4	1	2	9	1	3	0	1	.34
78	6	8	2	8	7	2	8	4	19	4	1	5	4	13	3	6	1	2	8	2	4	0	0	.36
79	4	9	1	7	6	2	4	3	13	4	2	5	3	12	3	3	1	1	9	1	3	0	0	.24
80	5	7	0	4	5	2	4	2	11	0	0	0	0	0	0	3	0	1	7	0	3	0	0	.08
81	6	6	6	3	7	2	8	4	19	4	2	7	4	15	4	6	2	2	6	3	4	1	0	.29
82	7	5	9	3	7	2	8	4	19	4	0	3	4	11	2	6	0	2	9	3	4	0	1	.29
83	6	9	7	7	6	2	4	3	13	4	2	7	4	15	4	6	2	2	9	6	4	1	1	.36
84	3	4	9	4	7	2	8	4	19	4	0	3	4	11	1	6	0	2	9	3	4	0	1	.28

TABLE 59

SUMMARY OF RESTRICTED MODELS FOR MODEL 1

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7763	.7558	37.92	14/153	.0000
ORD	.7757	.7568	40.98	13/154	.0000
TDF	.7745	.7554	40.68	13/154	.0000
UDF	.7544	.7337	36.39	13/154	.0000
TDS	.7651	.7453	38.59	13/154	.0000
UDS	.7620	.7419	37.93	13/154	.0000
OA	.7580	.7376	37.11	13/154	.0000
OM	.7718	.7525	40.06	13/154	.0000
DCA	.7717	.7524	40.05	13/154	.0000
DCM	.7710	.7517	39.88	13/154	.0000
LDF	.7723	.7531	40.19	13/154	.0000
SDF	.7728	.7536	40.30	13/154	.0000
NDP	.7647	.7449	38.51	13/154	.0000
SMD	.7529	.7529	36.09	13/154	.0000
LFS	.7762	.7574	41.10	13/154	.0000

TABLE 60

SUMMARY OF RESTRICTED MODELS FOR MODEL 1F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7053	.6924	54.70	7/160	.0000
DCM	.5980	.5830	39.91	6/161	.0000
TDS	.6372	.6237	47.13	6/161	.0000
DCA	.6876	.6759	59.05	6/161	.0000
TDF	.7015	.6904	63.06	6/161	.0000
UDS	.6926	.6812	60.47	6/161	.0000
LDF	.6763	.6642	56.06	6/161	.0000
SMD	.6767	.6646	56.15	6/161	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
DCM	.4349	.4315	127.77	1/166	.0000
+TDS	.5540	.5485	102.46	2/165	.0000
+DCA	.6109	.6038	85.84	3/164	.0000
+TDF	.6223	.6130	64.14	4/163	.0000
+UDS	.6403	.6292	57.68	5/162	.0000
+LDF	.6767	.6646	56.16	6/161	.0000
+SMD	.7053	.6924	54.70	7/160	.0000

TABLE 61

SUMMARY OF RESTRICTED MODELS FOR MODEL 1FC

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6572	.6487	78.11	4/163	.0000
DCM	.5610	.5530	69.86	3/164	.0000
TDS	.5889	.5814	78.31	3/164	.0000
OA	.5855	.5779	77.21	3/164	.0000
TDF	.6488	.6424	100.98	3/164	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
DCM	.4349	.4315	127.77	1/166	.0000
+TDS	.5540	.5485	102.46	2/165	.0000
+OA	.6488	.6424	100.98	3/164	.0000
+TDF	.6572	.6487	78.11	4/163	.0000

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TABLE 62

SUMMARY OF RESTRICTED MODELS FOR MODEL 2

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6879	.6802	89.82	4/163	.0000
TDF	.6453	.6388	99.44	3/164	.0000
UDF	.4632	.4534	47.17	3/164	.0000
TDS	.4361	.4258	42.28	3/164	.0000
UDS	.5352	.5267	62.96	3/164	.0000

TABLE 63

SUMMARY OF RESTRICTED MODELS FOR MODEL 3

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7454	.7309	51.40	9/158	.0000
OA	.7214	.7073	51.45	8/159	.0000
OM	.7351	.7218	55.17	8/159	.0000
DCA	.7395	.6264	56.42	8/159	.0000
DCM	.7206	.7066	51.27	8/159	.0000
LDF	.6963	.6810	45.56	8/159	.0000
SDF	.7271	.7133	52.95	8/159	.0000
NDP	.7145	.7001	49.74	8/159	.0000
SMD	.7209	.7068	51.33	8/159	.0000
LFS	.7448	.7320	58.02	8/159	.0000

TABLE 64

SUMMARY OF RESTRICTED MODELS FOR MODEL 3F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6628	.6545	80.90	4/163	.0000
DCM	.5778	.5701	74.81	3/164	.0000
OA	.5918	.5844	79.27	3/164	.0000
NDP	.6108	.6037	85.80	3/164	.0000
SMD	.6377	.6310	96.21	3/164	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
DCM	.4349	.4315	127.77	1/166	.0000
+OA	.5783	.5732	113.13	2/165	.0000
+NDP	.6377	.6310	96.21	3/164	.0000
+SMD	.6628	.6545	80.09	4/163	.0000

TABLE 65

SUMMARY OF RESTRICTED MODELS FOR MODEL 3FC

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6049	.5977	83.69	3/164	.0000
OM	.5502	.5447	100.90	2/165	.0000
OA	.5505	.5450	101.02	2/165	.0000
NDP	.5701	.5649	109.41	2/165	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
OM	.4871	.4840	157.62	1/166	.0000
+OA	.5701	.5649	109.41	2/165	.0000
+NDP	.6049	.5977	83.69	3/164	.0000

TABLE 66

SUMMARY OF RESTRICTED MODELS FOR MODEL 4

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7855	.7564	26.92	20/147	.0000
ORD	.7836	.7559	28.21	19/148	.0000
TDF	.7773	.7487	27.19	19/148	.0000
UDF	.7538	.7222	23.85	19/148	.0000
TDS	.7719	.7426	26.36	19/148	.0000
UDS	.7648	.7380	25.76	19/148	.0000
NDM	.7855	.7564	26.92	20/147	.0000
YDM	.7815	.7535	27.87	19/148	.0000
NOM	.7855	.7564	26.92	20/147	.0000
NWM	.7855	.7564	26.92	20/147	.0000
TSM	.7855	.7564	26.92	20/147	.0000
NDA	.7855	.7564	26.92	20/147	.0000
YDA	.7849	.7573	28.43	19/148	.0000
NOA	.7855	.7564	26.92	20/147	.0000
NWA	.7855	.7564	26.92	20/147	.0000
TSA	.7855	.7564	26.92	20/147	.0000
DCA	.7849	.7573	28.42	19/148	.0000
DCM	.7855	.7579	28.52	19/148	.0000
LDF	.7830	.7552	38.11	19/148	.0000
SDF	.7825	.7545	28.02	19/148	.0000
NDP	.7841	.7564	28.29	19/148	.0000
SMD	.7680	.7382	25.78	19/148	.0000
LFS	.7855	.7580	28.53	19/148	.0000

TABLE 67

SUMMARY OF RESTRICTED MODELS FOR MODEL 5

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7405	.7149	28.92	15/152	.0000
NDM	.7405	.7149	28.92	15/152	.0000
YDM	.7324	.7079	29.91	14/153	.0000
NOM	.7405	.7149	28.92	15/152	.0000
NWM	.7405	.7149	28.92	15/152	.0000
TSM	.7405	.7149	28.92	15/152	.0000
NDA	.7405	.7149	28.92	15/152	.0000
YDA	.7404	.7167	31.17	14/153	.0000
NOA	.7405	.7149	28.92	15/152	.0000
NWA	.7405	.7149	28.92	15/152	.0000
TSA	.7405	.7149	28.92	15/152	.0000
DCA	.7404	.7166	31.16	14/153	.0000
DCM	.7405	.7168	31.19	14/153	.0000
LDF	.6733	.6434	22.52	14/153	.0000
SDF	.7246	.6994	28.75	14/153	.0000
NDP	.7404	.7166	31.16	14/153	.0000
SMD	.7251	.7000	28.83	14/153	.0000
LFS	.7402	.7164	31.14	14/153	.0000

TABLE 68

SUMMARY OF RESTRICTED MODELS FOR MODEL 5F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6926	.6771	44.78	8/159	.0000
NDM	.6687	.6543	46.14	7/160	.0000
YDA	.6924	.6789	31.44	7/160	.0000
YDM	.6157	.5989	36.62	7/160	.0000
LDF	.6025	.5851	34.65	7/160	.0000
SMD	.6824	.6685	49.11	7/160	.0000
LFS	.6926	.6791	51.49	7/160	.0000
NDA	.6696	.6551	46.32	7/160	.0000
NDP	.6909	.6774	51.10	7/160	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NDM	.3858	.3821	104.25	1/166	.0000
+YDA	.4233	.4163	60.54	2/165	.0000
+YDM	.5002	.4911	54.71	3/164	.0000
+LDF	.6549	.6469	77.33	4/163	.0000
+SMD	.6610	.6505	63.18	5/162	.0000
+LFS	.6615	.6489	52.44	6/161	.0000
+NDA	.6909	.6774	51.10	7/160	.0000
+NDP	.6926	.6771	44.78	8/159	.0000

TABLE 69

SUMMARY OF RESTRICTED MODELS FOR MODEL 6

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6400	.6217	35.34	8/159	.0000
NDM	.6400	.6219	35.34	8/159	.0000
YDM	.6105	.5935	35.83	7/160	.0000
NOM	.6400	.6219	35.34	8/159	.0000
NWM	.6400	.6219	35.34	8/159	.0000
TSM	.6400	.6219	35.34	8/159	.0000
NDA	.6400	.6219	35.34	8/159	.0000
YDA	.6379	.6221	40.27	8/159	.0000
NOA	.6400	.6219	35.34	8/159	.0000
NWA	.6400	.6219	35.34	8/159	.0000
TSA	.6400	.6219	35.34	8/159	.0000

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TABLE 70

SUMMARY OF RESTRICTED MODELS FOR MODEL 6F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.5877	.5775	58.08	4/163	.0000
NDM	.5520	.5438	67.35	3/164	.0000
YDA	.5859	.5783	77.34	3/164	.0000
NWA	.5002	.4911	54.71	3/164	.0000
YDM	.4757	.4661	49.60	3/164	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NDM	.3858	.3821	104.25	1/166	.0000
+YDA	.4233	.4163	60.54	2/165	.0000
+NWA	.4757	.4661	49.60	3/164	.0000
+YDM	.5877	.5775	58.08	4/164	.0000

TABLE 71

SUMMARY OF RESTRICTED MODELS FOR MODEL 7

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7613	.7428	41.19	12/155	.0000
TDF	.7299	.7109	38.33	11/156	.0000
UDF	.6378	.6658	31.24	11/156	.0000
TDS	.7261	.7068	37.60	11/156	.0000
UDS	.7288	.7096	38.10	11/156	.0000
NDM	.7613	.7428	41.19	12/155	.0000
YDM	.7567	.7395	44.10	11/156	.0000
NOM	.7613	.7428	41.19	12/155	.0000
NWM	.7613	.7428	41.19	12/155	.0000
TSM	.7613	.7428	41.19	12/155	.0000
NDA	.7613	.7428	41.19	12/155	.0000
YDA	.7565	.7393	44.06	11/156	.0000
NOA	.7613	.7428	41.19	12/155	.0000
NWA	.7613	.7428	41.19	12/155	.0000
TSA	.7613	.7428	41.19	12/155	.0000

TABLE 72

SUMMARY OF RESTRICTED MODELS FOR MODEL 7F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.6495	.6342	42.36	7/160	.0000
NWM	.6110	.5966	42.16	6/161	.0000
UDS	.6209	.6068	43.95	6/161	.0000
YDA	.6490	.6359	49.62	6/161	.0000
YDM	.5426	.5255	31.83	6/161	.0000
TDF	.6138	.5994	42.65	6/161	.0000
NDM	.6409	.6275	47.89	6/161	.0000
NDA	.6420	.6287	48.12	6/161	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NWM	.4841	.4810	155.77	1/166	.0000
+UDS	.4949	.4888	80.83	2/165	.0000
+YDA	.5077	.4987	56.37	3/164	.0000
+YDM	.5892	.5792	58.4t	4/163	.0000
+TDF	.6302	.7188	55.22	5/162	.0000
+NDM	.6420	.6287	48.12	6/161	.0000
+NDA	.6495	.6342	42.36	7/160	.0000

TABLE 73

SUMMARY OF RESTRICTED MODELS FOR MODEL 8

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7404	.7184	33.78	13/154	.0000
NDM	.7404	.7184	33.78	13/154	.0000
YDM	.7215	.7000	33.47	12/155	.0000
NOM	.7404	.7184	33.78	13/154	.0000
NWM	.7404	.7184	33.78	13/154	.0000
TSM	.7404	.7184	33.78	13/154	.0000
NDA	.7404	.7184	33.78	13/154	.0000
YDA	.7404	.7203	36.83	12/155	.0000
NOA	.7404	.7184	33.78	13/154	.0000
NWA	.7404	.7184	33.78	13/154	.0000
TSA	.7404	.7184	33.78	13/154	.0000
LDF	.6722	.6468	26.49	12/155	.0000
SDF	.7235	.7021	33.80	12/155	.0000
NDP	.7403	.7202	36.82	12/155	.0000
SMD	.7245	.7032	33.97	12/155	.0000
LFS	.7401	.7199	36.77	12/155	.0000

TABLE 74

SUMMARY OF RESTRICTED MODELS FOR MODEL 8F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7016	.6866	46.74	8/159	.0000
NDM	.6665	.6519	45.67	7/160	.0000
YDA	.7011	.6881	53.62	7/160	.0000
YDM	.6189	.6022	37.12	7/160	.0000
LDF	.6068	.5896	35.28	7/160	.0000
SMD	.6912	.6777	51.16	7/160	.0000
LFS	.7016	.6886	53.75	7/160	.0000
NWA	.6696	.6551	46.38	7/160	.0000
NDP	.7016	.6885	53.73	7/160	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NDM	.3858	.3821	104.25	1/166	.0000
+YDA	.4233	.4163	60.54	2/165	.0000
+YDM	.5002	.4911	54.71	3/164	.0000
+LDF	.6549	.6464	77.33	4/163	.0000
+SMD	.6610	.6506	63.18	5/162	.0000
+LFS	.6615	.6489	52.44	6/161	.0000
+NWA	.7016	.6885	53.73	7/160	.0000
+NDP	.7016	.6866	46.74	8/159	.0000

TABLE 75

SUMMARY OF RESTRICTED MODELS FOR MODEL 9

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7831	.7585	31.85	17/150	.0000
TDF	.7753	.7515	32.56	16/151	.0000
UDF	.7506	.7242	28.40	16/151	.0000
TDS	.7689	.7445	31.41	16/151	.0000
UDS	.7645	.7396	30.64	16/151	.0000
NDM	.7831	.7585	31.85	17/150	.0000
YDM	.7752	.7514	32.55	16/151	.0000
NOM	.7831	.7585	31.85	17/150	.0000
NWM	.7831	.7585	31.85	17/150	.0000
TSM	.7831	.7585	31.85	17/150	.0000
NDA	.7831	.7585	31.85	17/150	.0000
YDA	.7790	.7555	33.26	16/151	.0000
NOA	.7831	.7585	31.85	17/150	.0000
NWA	.7831	.7585	31.85	17/150	.0000
TSA	.7831	.7585	31.85	17/150	.0000
LDF	.7800	.7567	33.45	16/151	.0000
SDF	.7800	.7567	33.46	16/151	.0000
NDP	.7823	.7592	33.90	16/151	.0000
SMD	.7665	.7417	30.98	16/151	.0000
LFS	.7830	.7600	34.06	16/151	.0000

TABLE 76

SUMMARY OF RESTRICTED MODELS FOR MODEL 9F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7339	.7187	48.41	9/158	.0000
NWM	.7165	.7023	50.24	8/159	.0000
YDM	.7065	.6917	47.85	8/159	.0000
LFS	.7339	.7205	54.81	8/159	.0000
YDA	.7328	.7194	54.52	8/159	.0000
UDS	.7305	.7169	53.87	8/159	.0000
LDF	.6595	.6423	38.49	8/159	.0000
SMD	.7192	.7050	50.90	8/159	.0000
NDA	.7321	.7186	54.30	8/159	.0000
SDF	.6983	.6831	45.99	8/159	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NWM	.4841	.4810	155.77	1/166	.0000
+YDM	.5582	.5529	104.25	2/165	.0000
+LFS	.5606	.5525	69.74	3/164	.0000
+YDA	.5732	.5627	54.73	4/163	.0000
+UDS	.5913	.5786	46.87	5/162	.0000
+LDF	.6838	.6720	58.03	6/161	.0000
+SMD	.6873	.6737	50.25	7/160	.0000
+NDA	.6983	.6831	45.99	8/159	.0000
+SDF	.7339	.7187	48.41	9/158	.0000

TABLE 77

SUMMARY OF RESTRICTED MODELS FOR MODEL 10

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7243	.7032	33.97	12/155	.0000
NDM	.7245	.7032	33.97	12/155	.0000
YDM	.7081	.6875	34.40	11/156	.0000
NOM	.7245	.7032	33.97	12/155	.0000
NWM	.7245	.7032	33.97	12/155	.0000
TSM	.7245	.7032	33.97	12/155	.0000
NDA	.7245	.7032	33.97	12/155	.0000
YDA	.7245	.7051	37.30	11/156	.0000
NOA	.7245	.7032	33.97	12/155	.0000
NWA	.7245	.7032	33.97	12/155	.0000
TSA	.7245	.7032	33.97	12/155	.0000
LDF	.6542	.6299	26.84	11/156	.0000
SDF	.7134	.6932	35.30	11/156	.0000
NDP	.7245	.7050	37.29	11/156	.0000
LFS	.7244	.7050	37.28	11/156	.0000

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TABLE 78

SUMMARY OF RESTRICTED MODELS FOR MODEL 10F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7101	.6974	55.98	7/160	.0000
NDM	.6767	.6646	56.15	6/161	.0000
YDA	.7063	.6953	64.52	6/161	.0000
YDM	.6847	.6730	58.27	6/161	.0000
LDF	.6131	.5986	42.51	6/161	.0000
SDF	.6623	.6497	52.63	6/161	.0000
LFS	.7100	.6992	65.69	6/161	.0000
NDP	.7068	.6959	64.69	6/161	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NDM	.3858	.3821	104.25	1/166	.0000
+YDA	.4233	.4163	60.54	2/165	.0000
+YDM	.5002	.4911	54.71	3/164	.0000
+LDF	.6549	.6464	77.33	4/163	.0000
+SDF	.7067	.6977	78.08	5/162	.0000
+LFS	.7068	.6959	64.69	6/161	.0000
+NDP	.7101	.6974	55.98	7/160	.0000

TABLE 79

SUMMARY OF RESTRICTED MODELS FOR MODEL 11

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7665	.7417	30.98	16/151	.0000
TDF	.7606	.7370	32.20	15/152	.0000
UDF	.7323	.7059	27.73	15/152	.0000
TDS	.7532	.7289	30.93	15/152	.0000
UDS	.7522	.7278	30.76	15/152	.0000
NDM	.7665	.7417	30.98	16/151	.0000
YDM	.7615	.7380	32.36	15/152	.0000
NOM	.7665	.7417	30.98	16/151	.0000
NWM	.7665	.7417	30.98	16/151	.0000
TSM	.7665	.7417	30.98	16/151	.0000
NDA	.7665	.7417	30.98	16/151	.0000
YDA	.7630	.7396	32.62	15/152	.0000
NOA	.7665	.7417	30.98	16/151	.0000
NWA	.7665	.7417	30.98	16/151	.0000
TSA	.7665	.7417	30.98	16/151	.0000
LDF	.7622	.7387	32.48	15/152	.0000
SDF	.7654	.7422	33.06	15/152	.0000
NDP	.7660	.7429	33.17	15/152	.0000
LFS	.7659	.7428	33.15	15/152	.0000

TABLE 80

SUMMARY OF RESTRICTED MODELS FOR MODEL 11F

Variable Omitted	R^2	Corrected R^2	F Ratio	df	Significance Level
None	.7143	.6980	43.89	9/158	.0000
NWM	.6852	.6693	43.26	8/159	.0000
YDM	.6291	.6105	33.72	8/159	.0000
YDA	.7130	.6986	49.38	8/159	.0000
TDF	.7041	.6892	47.30	8/159	.0000
UDS	.6956	.6802	45.41	8/159	.0000
TDS	.7034	.6885	47.13	8/159	.0000
LDF	.6810	.6650	42.44	8/159	.0000
NWA	.7083	.6937	48.27	8/159	.0000
NDP	.7115	.6970	49.02	8/159	.0000

Variable Added	R^2	Corrected R^2	F Ratio	df	Significance Level
NWM	.4841	.4810	155.77	1/166	.0000
+YDM	.5582	.5529	104.25	2/165	.0000
+YDA	.5712	.5634	72.93	3/164	.0000
+TDF	.6060	.5963	62.67	4/163	.0000
+UDS	.6302	.6188	55.22	5/162	.0000
+TDS	.6717	.6594	54.89	6/161	.0000
+LDF	.7069	.6941	55.13	7/160	.0000
+NWA	.7115	.6970	49.02	8/159	.0000
+NDP	.7143	.6980	43.89	9/158	.0000

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